

Spokane River Dissolved Metals Total Maximum Daily Load

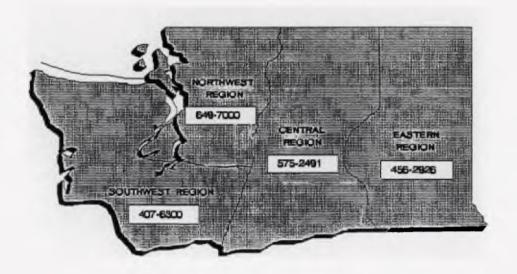
Submittal Report

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Spokane River Dissolved Metals Total Maximum Daily Load

Submittal Report

by Steve Butkus Ken Merrill

Washington State Department of Ecology Water Quality Program Post Office Box 47600 Olympia, Washington 98504-7600

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Table of Contents

List of Figures	ii
List of Tables.	ü
Introduction	1
Background	3
Applicable Criteria	4
Water Quality Impairments	6
Seasonal Variation	6
Modeling Approach	8
Loading Capacity	8
Load and Waste Load Allocations	9
Margin of Safety	10
Summary Implementation Strategy	10
References Cited	12
Figures.	13
Appendix A - Public Participation Materials	
Appendix B - Responses to Comments Recieved	
Appendix B - Quality Assurance Project Plan	

Appendix C - Technical Report: Pelletier, G. and K. Merrill. 1998. "Cadmium, Lead, and Zinc in the Spokane River - Recommendations for Total Maximum Daily Loads and Waste Load Allocations", Publication No. 98-329, Washington Department of Ecology, Olympia, WA.

List of Figures

Figure 1.	Spokane River Drainage System Map	13
	List of Tables	
Table 1.	Spokane River 1998 Section 303(d) Listed Segments	6
Table 2.	Seasonal Statistics of the Spokane River Total Recoverable Metals at Washington-Idaho Border	7
Table 3.	Seasonal Statistics of the Spokane River Hardness	7

Introduction

Section 303(d) of the federal Clean Water Act mandates that the State establish Total Maximum Daily Loads (TMDLs) for surface waters that do not meet standards after application of technology-based pollution controls. The U.S. Environmental Protection Agency (EPA) has established regulations (40 CFR 130) and developed guidance (EPA, 1991) for establishing TMDLs.

Under the Clean Water Act, every state has its own water quality standards designed to protect, restore, and preserve water quality. Water quality standards consist of designated uses, such as cold water biota and drinking water supply, and criteria, usually numeric criteria, to achieve those uses. When a lake, river or stream fails to meet water quality standards after application of required technology-based controls, the Clean Water Act requires that the state place the water body on a list of "impaired" water bodies and to prepare an analysis called a **Total Maximum Daily Load (TMDL)**.

The goal of a TMDL is to ensure the impaired water will attain water quality standards. A TMDL includes a written, quantitative assessment of water quality problems and of the pollutant sources that cause the problem. The TMDL determines the amount of a given pollutant which can be discharged to the water body and still meet standards, called the **loading capacity**, and allocates that load among the various sources. If the pollutant comes from a discrete source (referred to as a **point source**) such as an industrial facility's discharge pipe, that facility's share of the loading capacity is called a **wasteload allocation**. If it comes from a diffuse source (referred to as a **nonpoint source**) such as a farm, that facility's share is called a **load allocation**.

The TMDL must also consider seasonal variations and include a margin of safety that takes into account any lack of knowledge about the causes of the water quality problem or its loading capacity. The sum of the individual allocations and the margin of safety must be equal to or less than the loading capacity.

The Washington State Department of Ecology (Ecology) is establishing a Total Maximum Daily Load (TMDL) for the Spokane River for dissolved cadmium, lead, and zinc. This TMDL will address impairments due to potential toxic effects on the five segments of the river listed in the 1988 Section 303(d) list of impaired surface waters.

The five elements of the Spokane River Dissolved Metals TMDL as required by the Clean Water Act are:

Loading Capacity

In the case of dissolved metals in the Spokane River, a concentration measure is appropriate because the relationship between the effluent-based criterion and the receiving water quality holds for all effluent flow rates and critical conditions in the Spokane River. The proposed concentration-based allocations assure that the in-river concentration of the metals of concern will always be further below the aquatic toxicity criterion downstream of each discharge than was present upstream.

Wasteload Allocation

The Spokane River dissolved metals waste load allocation is based on the most restrictive permit limits derived by either meeting aquatic life toxicity criteria at effluent hardness at the end-of-pipe, or based on maintaining existing concentrations of metals in effluent using performance-based limits with an added 10 percent compliance buffer. Whichever method results in the lower limit will be selected for the permit limit and established as the wasteload allocation. A minimum of ten representative low-level metals analyses will be required of dischargers where adequate metals data does not exist to develop performance-based limits.

Load Allocations

The load allocation is the concentration required to meet the chronic criterion at the outlet of Lake Coeur d'Alene. However, the concentration-based wasteload allocation approach will assure compliance with Washington State water quality standards even if the Spokane River only meets the standards at the Washington-Idaho border.

Margin of Safety

Numerous conservative assumptions were made in model development to provide an inherent margin of safety. Extreme values of either 90th or 10th percentile values were used to estimate critical variables in the model application. In the worst-case scenario, the highest allowable effluent concentration as derived from the end-of-pipe, aquatic life criteria method will assure that downstream metals concentrations will be further below the aquatic life criteria than present upstream of each discharge. It is anticipated that wasteload allocations using the performance-based method will, in many cases, be much less than allocations using the end-of-pipe, aquatic life criteria method, and therefore will provide a greater margin of safety.

Seasonal Variation

Water quality data on metals and hardness collected in the Spokane River show seasonal variation at the Washington-Idaho border. The metals data show increasing trends as river flows increase. Significant variation in hardness also occurs during the lower river flows when groundwater inflow significantly affects river hardness moving progressively downstream in the Spokane Valley. The modeling approach used the conservative approach for critical conditions when river hardness is low.

Background

Geographic Setting

The source of the Spokane River is Lake Coeur d'Alene located in Idaho (Figure 1). The river flows in a westerly direction from the lake, across the state boundary line, to the city of Spokane. From Spokane, the river flows in a northwesterly direction to its confluence with the Columbia River. The Spokane River is approximately 111 miles long with a watershed covering 6,580 square miles. Major tributaries to the Spokane River include the Little Spokane River and Hangman (Latah) Creek. There are six hydroelectric dams located on the Spokane River.

Forested lands comprise a majority of the land use in Washington (55%), with agriculture (33%), urban (6%) and rangeland (3%) following in areas covered. Agricultural lands lie mainly in the Lower Spokane River, Little Spokane River, and Hangman Creek watersheds. Urban land use occurs mainly in the Middle Spokane River watershed, primarily due to the location of the City of Spokane. The population of the greater Spokane is 400,000. Other urban areas include Cheney (population 7,700), Medical Lake (population 3,700), Deer Park (population 2,300), and Airway Heights (population 2,000). The Spokane Indian Tribe's reservation is located in the lower river watershed, covering 155,000 acres of land (Knight, 1998).

The Spokane River has a complex geological history (Crosby et al., 1971). The basin is composed of highly porous, poorly sorted glacial deposits. The upper and lower river substrate is composed of granitic rock cobble. From River mile 90 to 85 the substrate is composed of rocks and boulders. The river does not exhibit typical riffle-pool morphology (Bailey and Saltes, 1982). Below the river lies the Spokane-Rathdrum Aquifer, which is the sole source of drinking water for the region.

The climate in the watershed is temperate. The region lies on the edge of a rain shadow created by the Cascade Mountain Range. Annual rainfall varies from 14 inches in the lower watershed to 35 inches in the upper watershed. The precipitation near the City of Spokane is 17 inches per year. The average temperature range is 21°F to 85°F, with extreme temperatures from below minus 30°F to over 100°F (Knight, 1998).

The annual average flow in the Spokane River is approximately 6,300 cfs. The lowest 7-day average flow with a 10-year recurrence at the upstream end near Post Falls is approximately 187 cubic feet per second (cfs). The highest 7-day average flow with a 10-year recurrence is approximately 36,000 cfs. Substantial inflows of groundwater enter the river beginning downstream from the Liberty Lake outfall. These groundwater inflows significantly increase the river flow rate, especially when surface water flows are low. The total net aquifer inflows range between 500 to 800 cfs. For comparison, the combined effluent flow from all permitted discharges is about 128 cfs (Pelletier and Merrill, 1998).

Description of Pollutant Sources

Seven wastewater treatment facilities legally discharge to the river. In Idaho, EPA permits the following discharges (proceeding downstream from the river source):

- City of Coeur d'Alene Advanced Wastewater Treatment Plant
- Hayden Area Regional Sewer Board Publicly-owned Treatment Works
- City of Post Falls Publicly-owned Treatment Works

Continuing downstream, Ecology permits discharges from:

- Liberty Lake Publicly-owned Treatment Works
- · Kaiser Aluminum Industrial Wastewater Treatment Plant
- Inland Empire Paper Company Industrial Wastewater Treatment Plant
- City of Spokane Advanced Wastewater Treatment Plant

Applicable Criteria

Description of the Applicable Water Quality Standards and Numeric Water Quality Target

Within The State of Washington, water quality standards are published pursuant to Chapter 90.48 of the Revised Code of Washington (RCW). Authority to adopt rules, regulations, and standards as are necessary to protect the environment is vested with the Department of Ecology. Under the federal Clean Water Act, the EPA Regional Administrator must approve the water quality standards adopted by the State (Section 303(c)(3)). Through adoption of these water quality standards, Washington has designated certain characteristic uses to be protected and the criteria necessary to protect these uses [Washington Administrative Code (WAC), Chapter 173-201A). These standards were last adopted in November 1997.

This TMDL is designed to address impairments of characteristic uses caused by toxic effects of metals. The characteristic uses designated for protection in the Spokane River are as follows:

"Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

- (i) Water supply (domestic, industrial, agricultural).
- (ii) Stock watering.
- (iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam and mussel rearing, spawning, and harvesting.

Crayfish rearing, spawning, and harvesting.

- (iv) Wildlife habitat.
- (v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).
- (vi) Commerce and navigation."

[WAC 173-201A-030(2)]

The water quality standards describe criteria for metals for the protection of characteristic uses. The Spokane River TMDL establishes allocations for cadmium, lead, and zinc. The chronic and acute criteria of these metals apply to the dissolved form and are calculated using water hardness (in mg/L as CaCO₃) based on the following equations:

Dissolved Cadmium

```
Chronic \leq (1.101672-((\ln(hardness))*(0.041838)))*EXP(0.7852*(\ln(hardness))-3.49)

Acute \leq (1.136672-((\ln(hardness))*(0.041838)))*EXP(1.128*(\ln(hardness))-3.828)
```

Dissolved Lead

```
Chronic \leq (1.46203-((ln(hardness))*(0.145712)))*EXP(1.273*(ln(hardness))-4.705)

Acute \leq (1.46203-((ln(hardness))*(0.145712)))*EXP(1.273*(ln(hardness))-1.46)
```

Dissolved Zinc

```
Chronic \le 0.986*EXP(0.8473*(ln(hardness))+0.7614)

Acute \le 0.978*EXP(0.8473*(ln(hardness))+0.8604)
```

[WAC 173-201A-040]

Water Quality Impairments

As a result of measurements made that show criteria are exceeded, the Spokane River (representing 18 segments) is included on Washington's 1998 Section 303(d) list (Table 1).

Table 1. Spokane River 1998 Section 303(d) Listed Segments

Listed Parameter	Segment Location
	(Township-Range-Section)
Cadmium	25N-46E-06
Lead	25N-42E-14, 26N-42E-20, 25N-46E-06
Zinc	25N-42E-14, 26N-42E-20, 26N-42E-33, 25N-44E-03, 25N-46E-06
PCBs*	27N-40E-22, 26N-42E-05, 26N-42E-07, 28N-37E-33
Chromium*	25N-42E-04
Arsenic*	25N-46E-06
Sediment Bioassay*	28N-37E-33, 25N-43E-01
Dissolved Oxygen*	25N-44E-06, 25N-46E-06
pH*	28N-36E-20
Temperature*	28N-36E-20
Total Phosphorus*	26N-42E-07

not addressed in this TMDL

Seasonal Variation

Data on total recoverable cadmium, lead, zinc, and hardness collected by Ecology at the Washington-Idaho border between 1991 and 1998 were compiled and descriptive statistics generated (Table 2). Sufficient dissolved metals data of which the TMDL is based were not available to compute similar statistics. However, similar patterns are observed with total recoverable metals and are used here only for presentation. Additional information regarding the relationship of dissolved metals with flows is presented in Pelletier and Merrill (1998). The dissolved metals vary with the seasonal flows.

Water quality data on total recoverable metals collected in the Spokane River show seasonal variation at the Washington-Idaho border. The total recoverable metals data show increasing trends as river flows increase in the spring. Water quality data on hardness collected in the Spokane River do not show significant seasonal variation at the Washington-Idaho border. However, hardness in the river does exhibit a large summer variation in the lower reaches downstream of where significant groundwater contributions to the river are observed (Table 3).

<u>Table 2</u>. Seasonal Statistics of the Spokane River Total Recoverable Metals at Washington-Idaho Border

Time Period		mium 2/L)		ead g/L)	Zinc (µg/L)		
	Median	Standard Deviation	Median	Standard Deviation	Median	Standard Deviation	
Winter (December-February)	0.3	0.8	1.5	6.2	86.5	12.3	
Spring (March-May)	0.4	0.0	3.1	6.4	89.6	10.3	
Summer (June-August)	0.3	0.1	1.6	3.1	47.0	18.0	
Fall (September-November)	0.2	0.1	1.2	0.7	49.0	23.7	
Annual (January-December)	0.3	0.5	1.5	4.6	79.5	23.0	

Table 3. Seasonal Statistics of the Spokane River Hardness (in mg/L as CaCO₃)

Time Period	River Mile 100.7		River Mile 96.0		River Mile 85.3		River Mile 66.0	
	Median	Standard Deviation	Median	Standard Deviation	Median	Standard Deviation	Median	Standard Deviation
Winter (December-February)	22.0	1.7	23.0	1.1	27.0	3.1	37.0	6.3
Spring (March-May)	23.0	2.2	23.0	0.6	26.0	1.6	36.0	2.3
Summer (June-August)	20.0	2.6	20.0	1.7	59.5	29.9	72.0	26.3
Fall (September-November)	21.0	2.0	20.5	0.7	37.0	3.4	58.0	6.3
Annual (January-December)	22.0	2.3	22.0	1.4	32.5	20.4	48.5	20.7

Modeling Approach

Linking Water Quality and Pollutant Sources

A mass-balance model of the Spokane River was developed to evaluate the effect of different effluent loading on metals and hardness (Pelletier and Merrill, 1998). The model includes a flow balance that accounts for inflow of water from the outlet of Lake Coeur d'Alene, inflow from permitted discharges, and flow exchanges from the aquifer and Hangman Creek. The model application assumed that Lake Coeur d'Alene outflow met Washington State water quality standards with a hardness of 20 mg/L as CaCO₃ and wastewater discharges met aquatic life toxicity criteria end-of-pipe ate effluent hardness. The model divides the river into 14 reaches from Lake Coeur d'Alene to near the headwaters of Long Lake (RM 64.6).

Calibration of the model to actual conditions in the river involved estimation of aquifer hardness and metals to match observed concentrations in the river. All other inputs in the flow and mass balance equations were directly estimated from available data. Relationships between hardness, metals, and flow are known at various locations in the river based on long-term ambient monitoring data. The model was calibrated for hardness by starting with the known upstream hardness and adjusting the groundwater hardness to equate predictions with observed values. After the hardness was calibrated, the same approach was used to estimate the dissolved cadmium, lead, and zinc of the inflows.

The calibrated mass-balance model was used to estimate concentrations of metals in the river for a variety of river flows and effluent flows. The model was used to evaluate whether water quality standards would be violated in the river assuming the river met Washington State water quality standards when it leaves Lake Coeur d'Alene and the effluent met aquatic life criteria-based limits at the point of discharge based on effluent hardness. The model results show that standards would be met for cadmium and zinc. The standards for lead would be met if the maximum concentration of total recoverable lead in the effluent does not exceed the value predicted from the extrapolated tangent line of the chronic criterion equation.

Loading Capacity

Identification of the loading capacity is an important step in developing TMDLs. The loading capacity is the amount of pollutant a water body can receive and still meet water quality standards. By definition, a TMDL is the sum of the allocations. An allocation is defined as the portion of a receiving water's loading capacity that is assigned to a particular source. EPA defines the loading capacity as "the greatest amount of loading that a water can receive without violating water quality standards."

The hardness of the wastewater effluent from the various discharges is significantly higher than the hardness of the Spokane River. The metals criteria for protection of aquatic life are based on hardness, because the toxicity of metals decreases as hardness increases. Thus, as the Spokane River flows downstream, its loading capacity for metals increases due to inflow of harder water.

The Spokane River Metals TMDL utilizes a different measure than "daily loads" to fulfill requirements of Section 303(d). Instead, the TMDL is expressed in terms of concentration as allowed under EPA regulations [defined as "other appropriate measures" in 40 CFR §130.2(i)]. In this case, a concentration measure is appropriate because the relationship between the effluent hardness-based criterion and the receiving water quality holds for all river and effluent flow rates. The use of effluent flow to establish a loading limit would not only be unnecessary, but also could be misconstrued to represent a restriction on effluent flow. Also, a loading limit could require unnecessary TMDL and permit modifications to change loading limits as communities grow and flows increase.

Load and Waste Load Allocations

Cadmium, lead, and zinc concentrations in the Spokane River at the state line often exceed water quality standards. EPA and Idaho Department of Environmental Quality are developing a TMDL to control pollution sources in Idaho. One of the necessary objectives of the work is to meet Washington's water quality standards in the Spokane River. The load allocation is the concentration required to meet the chronic criterion at the outlet of Lake Coeur d'Alene. The wasteload allocations in Washington assure compliance with Washington State water quality standards if the criteria are met only at the Washington-Idaho border

The waste load allocation is based on the most restrictive permit limits based on the comparison of:

- Potential limits based on meeting aquatic life criteria at effluent hardness, or
- Potential limits, plus 10%, based on maintaining existing concentrations of metals in effluent, where adequate data exist.

Whichever method results in the lower limit is established as the waste load allocation.

Margin of Safety

The statute requires that a margin of safety be identified to account for uncertainty when establishing a TMDL. The margin of safety can be explicit in the form of an allocation, or implicit in the use of conservative assumptions in the analysis. Several assumptions and critical conditions used in the modeling analysis of the Spokane River TMDL provide an inherent margin of safety as required by the statute. These conservative assumptions and critical conditions are listed below:

- Effluent hardness was assumed to be the 10th percentile hardness as measured at the Spokane Advanced Wastewater Treatment Plant
- Effluent hardness was assumed to be a lower value based on a mixture of river and groundwater used for production proposes at the Kaiser Industrial Wastewater Treatment Plant.
- Effluent total recoverable metal concentrations were assumed to be approximate maximum values reported.
- The hardness for the outflow for Lake Coeur d'Alene was assumed to be the seasonal 10th percentile for the low flow and high flow periods, and the 5th percentile from all seasons.
- The hardness in the river was assumed to equal the 10% prediction limits from the regression equations with flow.
- The dissolved metals were assumed to equal the 90% prediction limits from the regressions with flow.

Summary Implementation Strategy

The success of the TMDL largely relies on controlling the upstream sources in Idaho so that the toxicity criteria of Washington's Water Quality Standards for Surface Water (WAC 173-201 A) are met at the Washington/Idaho border. Effluent limits will be placed in all NPDES permits for direct discharge to the Spokane River where adequate low-level effluent data exist.

Monitoring Plan for TMDLs Developed Under the Phased Approach

EPA (1991) guidance calls for a monitoring plan for TMDLs where implementation will be phased in over time. The monitoring is conducted to provide assurance that the control measures achieve the expected load reductions. All Spokane River NPDES discharge permits in Washington, which do not currently have adequate metals monitoring, will be opened and monthly monitoring will be added by the end of 1999, which will follow appropriate clean sampling protocols and EPA 1600-series analytical methods for total recoverable. Quarterly dissolved metals monitoring should also be included if source-specific effluent dissolved/total recoverable metals ratios are to be determined.

Reasonable Assurances

All Spokane River dischargers will have the TMDL-based limits placed in their permits within 2½ years from the initiation of monthly low level monitoring. Monitoring requirements have already been placed in the Liberty Lake Sewer District permit and effluent metals limits will be put into City of Spokane's permit which is now targeted to be issued in June 1999.

References Cited

- Bailey, G.C and J. Saltes. Fishery Assessment of the Upper Spokane River. Report 46. State of Washington Water Research Center, Pullman, WA.
- Crosby, J.W., et al. 1971. Investigation of techniques to provide advance warning of groundwater pollution hazards with special reference to aquifers in glacial outwash. Final Report to OWRR, Project No. B-005-WASH. State of Washington Water Research Center, Pullman, WA.
- Knight, D.T. 1998. Watershed Approach to Water Quality Management Needs Assessment for the Spokane Water Quality Management Area (WRIA 54-57). Publication No. WQ-98-21. Washington State Department of Ecology, Spokane, WA
- Pelletier, G. and K. Merrill. 1998. Cadmium, Lead, and Zinc in the Spokane River Recommendations for Total Maximum Daily Loads and Waste Load Allocations. Publ.
 No. 98-329. Washington State Department of Ecology, Olympia, WA.
- SASSI, 1993. 1992 Washington State Salmon and Steelhead Stock Inventory. Washington Department of Fisheries, Washington Department of Wildlife and Western Washington Treaty Indian Tribes. Olympia, WA.
- U.S. Environmental Protection Agency. 1991. Guidance for Water Quality-based Decisions: The TMDL Process. EPA 440/4-91-001. Washington, DC.

Figures

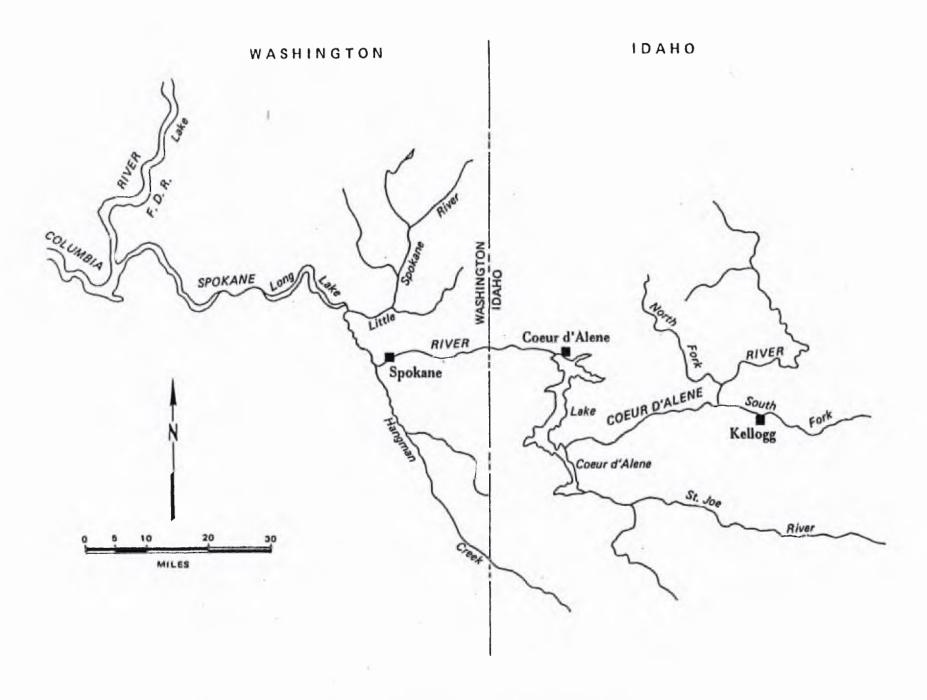


Figure 1. SPOKANE RIVER DRAINAGE SYSTEM

Appendix A

Public Participation Materials



Focus

Spokane River Metals: Total Maximum Daily Loads (TMDL) in Washington State

What is a TMDL?

The federal Clean Water Act requires states to conduct statewide water quality assessments to identify and list surface waters that do not meet water quality standards. For those bodies of water, states must establish maximum limits on the amounts of pollutants that can be discharged to a water body and still allow that water body to meet water quality standards. These limits are called Total Maximum Daily Loads (TMDL).

Both Idaho and Washington are required to establish metals TMDLs to protect water quality and the "beneficial uses" of the water in the Spokane River. Surface waters, such as lakes and rivers, can assimilate pollutants to some extent through a natural process of self-purification. The amount of pollutants that a body of water can assimilate without violating state water-quality standards is called "loading capacity."

TMDLs are usually equal to a water body's loading capacity, with a safety margin to allow for error and pollutants from unknown sources. Once set, the Department of Ecology divides the load between the various "point-source" dischargers. That is called the "waste load allocation." This approach allows us to look at the entire watershed when planning how to protect it.

TMDLs and waste load allocations allow the states to fairly allocate reasonable discharges for municipalities and industries along the river. The goal of the Spokane River Metals TMDL is to allow the dischargers to continue to operate, while we use a watershed-based approach to bring the Spokane River back into compliance with water quality standards for lead, cadmium and zinc.

What's wrong with the river?

The Spokane River regularly violates water quality standards for zinc. Standards for lead and cadmium are also violated frequently, especially at higher flows.

Concentrations of dissolved zinc, lead, and cadmium in the Spokane River are one to two orders of magnitude higher (about 10 - 100 times) than other major rivers Ecology monitors. The Spokane River is the only river we monitor that fails the Environmental

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Protection Agency's (EPA's) aquatic life criteria for dissolved zinc, lead, and cadmium.

As of this summer, Ecology's environmental investigations staff has seen no change in the pattern we have seen for the past six years with regard to metals concentrations in the river: Concentrations of dissolved zinc almost continually violate EPA and state water-quality standards (both acute and chronic). Dissolved-lead concentrations are higher than the chronic standard during the high-flow season. The zinc and lead violations occur through most of the river. Cadmium violates the chronic criteria during high flow, but only in the upper river. The highest concentrations of all three of these metals occur during the highest flows. Violations occur every year.

Why is this important to industries and towns along the river?

The Spokane River is not meeting state and federal standards for zinc, lead and cadmium because of past mining practices in Idaho's Silver Valley. This has posed a major problem for industrial and municipal wastewater dischargers along the Spokane River in both states.

Without a TMDL, industries and municipalities would have limits set that would allow no additional discharge of metals. This means industries and municipalities in Washington may be unduly penalized for even minor discharges of these metals. If additional controls are needed to meet these limits, they face extremely expensive upgrades that would only slightly lower metal concentrations in the river.

Establishing TMDLs and reasonable wasteload allocations for dischargers in both Idaho and Washington will help focus the efforts of both states on cleaning up mining wastes. It also will ensure that the dischargers are not *adding* to the problem of metals in the river.

What does the Spokane River TMDL do?

The Spokane River TMDL gives industries and municipalities along the river a "waste load allocation," identifying the maximum concentration of each pollutant they can discharge without causing the river to violate water quality standards. However, this TMDL is different. It was written based on the assumption that water quality standards are being met at the Idaho-Washington border. We know that the major source of the metals that cause the river to violate water quality standards is not within Washington state. Therefore, we should not penalize Washington industries and municipalities along the river by not allowing them to discharge any metals at all.

The Spokane River should be considered a **shared resource**. It is extremely important that the source of the metals in Idaho be controlled as soon as possible.

The ultimate success and appropriateness of this document depends solely on whether Idaho's Department of Environmental Quality or EPA develops and implements an adequate TMDL and management plan to meet Washington's water-quality standards

at the upstream end of the Spokane River. It is imperative that the goal of any TMDL or other clean-up activity in Idaho is for the Spokane River to meet all metals criteria at the outlet of Coeur d'Alene Lake.

The Spokane River TMDL has two parts:

- The first part looks at meeting water quality standards at the end of each discharger's pipe, based on the hardness of the water in the pipe. Water is considered harder when it has more calcium and magnesium. Increased water hardness makes a given concentration of metal less toxic. The softer the water, the more toxic the metals are to aquatic life. Ground water in the Spokane area is much harder than river water. Since municipalities and industries primarily use ground water in their processes, we took the effect of the additional hardness into account when determining the concentration of metals the facilities may discharge. This allocation analysis shows that dischargers are adding proportionately more hardness to the river than metals.
- 2. The dischargers must also meet a second test by not increasing the average concentration of the metals currently in their discharge. In other words, we would set discharge limits to ensure the dischargers do not significantly increase metal concentrations above their current average. This would be based on the average and variability of the measured concentrations for however long we have data. (For this to be representative of current quality, we need at least ten data points.) Since changes in operation and upgrades would occur over time, the industries and municipalities would have this "performance-based" test reevaluated each time we re-issue a permit to a facility (typically every five years). While these performance limits may change over time, they could never exceed the limit addressed in step one above.

Public Involvement in the TMDL Process

Ecology encourages affected dischargers, local governments and other interested citizens to comment on the Spokane River TMDL and to participate in the TMDL process.

Copies of the TMDL report are available for review at the Spokane County Valley Branch and Spokane City Downtown Branch libraries until November 31, 1998; at Ecology's Eastern Regional Office; and at Kinko's on North Division in Spokane. All comments need to be submitted in writing and addressed to Department of Ecology, Attn: Ken Merrill, Eastern Regional Office, 4601 N. Monroe, Spokane, WA, 99205-1295. Comments will be accepted until November 27, 1998.

For More Information

If you have questions about the Spokane River Metals TMDL process, would like copies of information packets, or have special accommodation needs, contact Jani Gilbert at (509) 456-4464 (voice) or (509) 458-2055 (TDD).

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PUBLIC WORKSHOP and REQUEST FOR COMMENTS Spokane River. Total Maximum Daily Load in Washington State for Cadmium, Lead, and Zinc

The federal Clean Water Adreguires states to conduct statewis water quality assessments to identify and list surface waters (303d list) that do not meet water quality.

term watershed-based approaregulating "point source" chargers along the river. The vido this is through a Total Max Daily Load process rather imposing unreasonable firms

6 p.m

Ecology's Eastern Regional Office 4601 N. Monroe, Spokane, WA

copies of the TMDL report will be

I, Diane L. Thom

do solemnly swear that I am the Principal Clerk of the SPOKESMAN-REVIEW, a newspaper established and regularly published, once each day in the English language, in and of general circulation in the City of Spokane, Spokane County, Washington; and in the City of Coeur d'Alene, Kootenai County. Idaho: that said newspaper has been so established and regularly published and has had said general circulation continuously for more than six (6) months prior to the 23rd day of July, 1941; that said newspaper is printed in an office maintained at its place of publication in the City of Spokane, Washington; that said newspaper was approved and designated as a legal newspaper by order of the Superior Court of the State of Washington for Spokane County on the 23rd day of July, 1941, and that said order has not been revoked and is in full force and effect; that the notice attached hereto and which is a part of the proof of publication, was published in said newspaper, one time(s), the publication having been made once each time on the following dates:

October 9, 1998

That said notice was published in the regular and entire issue of every number of the paper during the period of time of publication, and that the notice was published in the newspaper proper and not in a supplement.

Subscribed and sworn to before me at the City of Spokane, this 9 day of October, 1998

Notary Public in and for the State of Washington. JET 1. 1.4.

residing at Spokane, Wash.

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50147 JA

OFFICIAL SEAL
SUE A. JOHNSON
NOTARY PUBLIC-STATE OF WASHINGTON
COUNTY OF SPOKANE
My Commission Expires May 1, 2000

Form G-16

Notary Public in and for the State of Washington, residing at Spokane, Wash.

sworn to before me at the City of Spokane, this $\frac{27}{2}$ day of,

ECOLOGY

State for Cadmium, Leau, and Zinc

The Washington State Department of Ecology has just completed a draft plan for a long-term watershed-based approach for regulating industrial and municipal "point source" dischargers along the Spokane River. Since the Spokane River does not meet state water quality standards for some metals, Ecology is required to set maximum limits on the amounts of pollutants that can be discharged to the river. These limits are called Total Maximum Daily Loads (TMDL).

Ecology invites affected dischargers, local governments and other interested citizens to comment on the Spokane River TMDL and to attend a public workshop being held to explain and discuss the plan.

October 21, 1998 6 p.m. Ecology's Eastern Regional Office, 4601 N. Monroe, Spokane, WA.

Copies of the TMDL are available for review at the Spokane County Library (Vailey Branch), Spokane City Library (Downtown Branch) and Ecology's Eastern Regional Office. Copies of the report can also be obtained from Kinko's, 7116 N. Division, Spokane, WA at a per-copy rate. All comments need to be submitted in writing and addressed to Department of Ecology, Attn: Ken Merrill. Eastern Regional Office, 4601 N. Monroe, Spokane, WA, 99205-1295. Written comments will be accepted until November 27, 1998. If you have special accommodation needs, contact Jani Gilbert at (509) 456-4464 (voice) or (509) 458-2055 (TDD).

a

Reierson for District Court Judge

• Bill Edelblute, Treasurer •

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SPOKANE RIVELL PUBLIC WORKSH OP

Total Maximum Daily Loads in Washington State for Cadmium, Lead, and Zinc

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SPOKANE RIVER METALS TMDL-PUBLIC WORKSHOP
6:00 PM, 10-21-98

Name_ (b) (6)	Add	ress		Phone +
	*			

Mailing List

Organization Name	Prefix	First N.	. Last Name	Title vp	Address	City	Stet	
Au obon Society of Spokane					[(b) (6)	Spokane	WA.	99202
Clean Lakes Coordination Council	Me	Line	Prochnowl			Coeur d'Alene	ID	83814
Codur d'Alene Basin Restoration Project	Mr	Tom	Whitten	Project Coordinator		Coeur d'Alene	ID	83814
Friends of The Centennial Trail		727.0	The Assessment of the Control of the	N -3/2 N//		Spokane	WA	99201
Idaho Water Resource Research Institute	Ma	Cathy	Canfield-Davis	U of I, Cd'A Campus		Coeur d'Alene	ID	83814
Landa Council	Mr	Mark	Soloman	Executive Director		Spokane	WA	99202
Inland Northwest Land Trust	Mr	Chris	DeForest	Executive Director		Spokane	WA	99201
Inland Northwest Wildlife Council	Mr	Robert	Panther			Spokana	WA	99207
Lake Spokana Protection Association	Mr	Clem	Crowston			Spokene	WA	99026
Little Spokene River Council						Spokene	WA	99210
Northwest Mining Association	Ma	Laura	Skner	Executive Director	10 N. Post Street, Suite 414	Spokane	WA	99201-0772
Northwest River Ecology					8115 N. Astor	Spokane	WA	99207
Sierra Club-Upper Columbia River					517 S, Division St.	Spokane	WA	99202
SIRTI	Dr	Joseph	Ritchey		665 N. Alverpoint Blvd.	Spokane	WA	99202-1665
Spokane Canoe and Kayak Club					PO Box 819	Spokane	AW	99210
Spokane League of Women Voters	Ms	Pam	Behring		315 W. Mission Suite 8	Spokane	WA	99201
Spokane Walleye Fishing Club					PO Box 14101	Spokane	WA	99214
Trout Unlimited, Spokane Falls Chapter	Mr	Dave	James		3020 W. Glass	Spokane	WA	99206
Washington Environmental Council	Ms	Bonnle	Mager		315 W. Mission	Spokane	AW	99201
Cheney WWTP	Mr	Ron	Eaton		119 W Anderson Road	Cheney	WA	99004
City of Post Falls	Mr	Darrell	Hollings		408 Spokene St.	Post Falls	ID	83854
City of Spokane	Mr	Dale	Arnold	The second reserve the second	808 W. Spokene Falls BLVD.	Spokene	WA	99201-3333
City of Spokane	Mr	Gale	Olrich	City Wastewater			WA.	
City of Spokane Wastewater Management	Mr	Tim	Pelton		4401 N. A.L. White Parkway	Spoksne	WA	99205-3939
Liberty Lake Sewer Dist. #1	Mr	Lee	Mellish	Manager	PC Box 184	Liberty Lake	WA.	99109
Medical Lake STP	Mr	Pete	Rose		South 124 Lefevre St.	Medical Lake	WA.	99022
Rockford Town of STP	Mr	R. Grey	Fairbanks		20 W Emma St.	Rockford	WA	99030
Spangle Town of STP	The Honorable	John	Logan		PO Box 147	Spengle	WA	99031
Inland Empire Paper Co.	Mr	Wayne	Andresen		3320 N Argonne Rd	Spokane	WA	99212
Johnson Matthey Electronics	Mr	Jim	Wilson		15128 E Euclid Ave	Spokane	WA	99216
Kaiser Mead	Mr	Michael	Sawatzky		E 2111 Hawthorne Rd	Mend	WA	99021 99215
Kaiser Trentwood	Mr	Patrick J.	Blau		PO Box 15108	Spokane	WA.	
Novation Inc.	Mr	Michael A.	Salvie	Q.A. Manager	2616 N Locust Rd	Spokane	WA.	99206 99202
Wash Water Power	Mr	Douglas	Pottratz		1411 E Mission St	Spokane		
Washington Water Power	Ms	Ann	Botlman		PO Box 3727	Spokane	WA	99220
Washington State Representative Dist 03	The Honorable	Jeff	Gombosky		PO Box 40600	Olympia	WA	98504-0600
Washington State Representative Dist 06	The Honorable	Duane	Sommers		PO Box 40600	Olympia	WA.	98504-0600
Washington State Senator District 03	The Honorable	Lisa	Brown		PO Box 40482	Olympia	WA	98504-0482
Washington State Senator District 06	The Honorable	James E.	West		PO Box 40482	Olympia	WA.	98504-0482
Spokane Tribe	Mr	Rudy	Peone		PO Box 100	Wellpinit	WA	99040-0100
Spokane Tribe	Ms	Mary	Verner		PO Box 100	Wellpinit	WA	99040-0100
		- 			2195 Ironwood Court	Coeur d'Alene	ID	83814
Idaho Panhandia Health District	Mr	Ken	Lustig		1101 W. College	Spokane	WA	99201
Spokane County Health District	Mr	Mike	LaScuola		1500 W 4th Ave, Suite 305	Spokene	WA	99204
WA State Dept of Health	Mr	Craig	Riley				WA	99207
WA Dept. of Transportation	Mr	Jim -	Prudente		N 2714 Mayfair	Spokene	IWA	99206
U.S. Fish and Wildlife	Mr	Bob	Hallock		11103 E. Montgomery Dr., Suite 2	Spokene		
WA Dept. of Fish & Wildlife	Ms	Carmen	Andonaegui		8702 N. Division	Spokane	WA	99218-1199
WA Dept. of Fish & Wildlife	Mr	John	Andrews		N 8702 Division	Spokane	WA	99218
WA Dept. of Fish & Wildlife	Mr	Al	Palmanteer		N 8702 Division	Spokana	WA	99218

Organization Name	Prefix	First N.	Last Name	Title	Address	City	State	Postal Code
WA Dept. of Fish & Wildlife	Mr	Kevin W.	Robinette	Habitat Blologist	8702 N. Division	Spokane	WA	99218-1199
	Mr	John	Whalen		N 8702 Division	Spokana	WA	99218
WA Dept. of Fish & Wildlife	Mr	Tim	Erkel		PO Box 273	Chatteroy	WA	99003
Army Corp of Engineers	MI				4217 E. Main	Spokana	WA	99202
Bureau of Land Management	Mr	Todd	Thompson		N 4601 Monroe, Suite 202	Spokana	WA	99205
Environmental Protection Agency	Mr	Chuck	Rice			Sandpoint	ID	83864
United States Geological Survey	Mr	Mike	Beckwith	Water Resources Div.	1500 Highway 2, Rm 336			99201
United States Geological Survey	Mr	Ray	Smith	Water Resources Div.	US Courthouse, 6th Floor, Rm 694	Spokane	WA	
Idaho Department of Environmental Quality	Ms	Gwen	Fransen		2110 Ironwood Parkway Ste 100	Coeur d'Alene	ID	83814
Couer d'Alene River Basin Commission	Mr	Dick	Panabaker		2110 Ironwood Parkway	Cosur d'Alene	ID	83814
	Ms	Tammy	Williams		1026 W. Broadway Ave.	Spokana	WA	99260-0170
Spokane County	Mr	Bruce	Rawis	Director	1026 W. Broadway Ave.	Spokane	WA	99260-0170
Spokene County Utilities	1011	Dideo	11.041.0		1116 W. Broadway Ave	Spokane	WA	99260-2052
Spokane County Board of Commissioners			Miller	Manager, WQ Mngt. Program	1026 W. Broadway Ave	Spokane	WA	99260-0170
Spokane County Utilities (WQMP)	Mr	Stan		Manager, WC Milgt. Program	PO Box 11187	Spokane	WA	99211-1187
Spokene Joint Aquifer Board	Mr	Тү	Wick			Spokane	WA	99201
Lands Council	Ms	Michelle	Nanni		517 S Division		WA WA	99218
WA State Dept of Fish & Wildlife	Mr	John	Andrews		N. 8702 Division	Spokane		
EPA Region 10 - Office of Water	Mr	Philip	Millam		1200 Sixth Avenue	Seattle	WA	98101
Idaho Department of Environmental Quality	Mr	Jeff	Harvey		1200 Ironwood Parkway Ste 100	Couer d'Alene	ID .	83814
EPA Region 10 - Office of Water	Mr	Ben	Соре		1200 Sixth Avenue	Seattle	WA	98101
Couer d'Alene Tribe	Mr	Norm	Campbell		PO Box 408	Plummer	ID	83851
	Mr	Sid	Fredrickson		710 Mullen	Couer d'Alene	ID	83814
City of Coeur d'Alene	Mr	Kent	Helmer		171 E Hayden Avenue	Hayden Lake	łD	83835
Hayden Area Regional Sewer Board	Ms	Sara	Hubbard-Gray		10408 North Woodridge Drive	Spokene	WA	99208
Hubbard-Gray Consulting	IVIS	3010	Trabbaro Gray					

Appendix B

Responses to Comments Received

Cadmium, Lead, and Zinc in the Spokane River:

Recommendations for Total Maximum Daily Loads and Waste Load Allocations

Response to Comments

Comment 1:

"Upon approval of its facility plan, the City of Spokane has committed to an ambitious schedule of capital improvements to its treatment system: Both collection conduit and the treatment plant. Many of the capital improvements are designed to reduce the amount of infiltration and inflow (clean water) that enters the collection system and reaches the treatment plant. If the flow reducing improvements are implemented and water conservation increases, constituents within the flow will be concentrated. Concentration of flows may result in increased levels of background (domestic) metal concentrations in plant influent and effluent. The City of Spokane should not be penalized for reducing clean water flows into the wastewater treatment system.

The City of Spokane therefore requests the metals concentration limits to be increased by 20% to allow for the concentration effects of flow reduction efforts in the future. We also reaffirm our support for periodic review of limits to determine if they are feasible, attainable and if they produce the desired effect."

Response 1:

It is acknowledged that influent character and volume may change over-time and may change the character of the effluent. It is anticipated that diligent implementation of source controls in a pretreatment program, public education, and improved treatment technology may also affect future influent and effluent quality. Evaluation of influent character and effluent metals concentration with each NPDES permit renewal should determine if uncontrollable circumstances have changed the ability of the discharger to achieve historical performance. However, Ecology agrees that, due to the sensitivity of the ultra-clean sampling and the low concentrations of metals being tested, a buffer added to the performance-based limits would be appropriate. Therefor, Ecology will add a 10 percent buffer to the performance-based limit before the evaluation for deciding which limit should be used in the permit.

Comment 2:

"While we realize that Washington law provides for anti-degradation by requiring an AKART approach, the water quality models show that rather than take assimilative capacity from the river, the dischargers actually add capacity. The document recognizes this relationship. If a plant's discharge is below the standard, then it is below the standard and no further restriction needs to be placed. There is no degradation of water quality and AKART is unnecessarily redundant and overly restrictive beyond the regulatory standard. There simply is no basis of science or law to go beyond the standard. To do so is akin to saying, "If a pH of 7.0 is good, then 2.0 is better." Obviously ridiculous. We would ask you to impose the standard; no more or no less."

Response 2:

The proposed TMDL evaluated the added hardness from the wastewater discharges in the Spokane River. The added hardness does decrease the toxicity of any given concentration of

metal in the river. However, it is not consistent with the intent of the federal and State antidegradation policy, nor appropriate, to adopt a long term river clean-up plan that would unnecessarily allow dischargers to raise the metal concentrations in effluent disposed of in the river while, at the same time, spending large amounts of dollars to eliminate upstream sources. Simply because the effluent also adds more hardness to the river does not mean that the discharger should be allowed to negate all of the toxicity reduction benefits realized from the increased hardness by increasing their metals concentrations. Ecology decided that it would be better to evaluate the river system as a whole, taking into account all sources of hardness, dissolved metals and their relation to river water quality criteria along with reasonable expectations of the metal concentrations in the wastewater discharges. This is especially true for a waterbody that currently violates several water quality standards. The proposed approach for developing waste load allocations by comparing the performance-based or effluent hardness-based limits allows the river's aquatic ecosystem to benefit from any hardness related toxicity reduction and allowing the dischargers to operate as they have without restricting growth while upstream metal sources are abated.

Comment 3:

"The lowest 7Q10 flow is noted as being 187 cfs. This is incorrect. WWP must maintain a minimum flow of 300 cfs by their license. They also note that the Post Falls dam leaks 200 cfs. IDEQ calculates the 7Q10 flow as being about 1100 cfs."

Response 3:

The Spokane River 7Q10 flow of around 187 cfs at the Post Falls gage appears to appropriate after again reviewing USGS data summaries. It is Ecology's understanding that WWP has maintained a minimum flow of 300 cfs or what is coming into Lake Coeur 'd Alene to maintain a steady lake level. Ecology will rely on USGS flow data for flows below the Post Falls Dam and methods for evaluating flow data unless good evidence is presented showing that they are incorrect.

Comment 4:

"It is noted in Appendix A how the tangent starting at a hardness value of 20 mg/L is proposed to set the discharge concentrations at the individual effluents. This may be an unnecessarily conservative approach." "It is questionable whether or not this represents a significant difference; especially when considering the Method Detection Limit as listed in Standard Methods¹ is 40 µg/L. However, ultra-clean sampling and testing methods are able to achieve a much lower detection limit."

Response 4:

The reason for establishing the tangent line equation for lead was to insure that a mixture of river and effluent would never exceed the criterion as explained on page 4 of the TMDL document. Ecology agrees that it may not result in a very large difference from the lead criterion, but it is the technically defensible approach and may give measurable differences using clean sampling and low level analytical techniques (EPA 1600-series methods) reaching a method detection limit of $0.015~\mu g/L$

Comment 5:

"It is strongly suggested that an assumed river hardness of 25 mg/L as CaCO₃ be used. The calculated results using values less than 25 mg/L demonstrate the error of this assumption and further notes that the equations do not hold below a value of 25 mg/L. This is evidenced by the calculated results for total recoverable and the dissolved criterion.

At a river hardness of 10 mg/L, the dissolved criterion is calculated at 0.19l μ g/L while the total recoverable is 0.170 μ g/L. At a river hardness of 20 mg/L, the dissolved criterion is calculated at 0.421 μ g/L while the total recoverable is 0.410 μ g/L. In both cases the dissolved is higher than the total recoverable. This, of course, is a physical impossibility. It is suggested that an approach that would be more reflective of actual conditions would be to recognize hardness value below 25 mg/L. As a matter of fact, 40 CFR §131.36 $^{\circ}$ (4)(I) states, in part.

"For purposes of calculating freshwater aquatic life criteria for metals from the equations in paragraph (b)(2) of this section, the minimum hardness allowed for use in those equations shall not be less than 25 mg/l, as calcium carbonate, even if the actual ambient hardness is less than 25 mg/l as calcium carbonate."

The fact that Washington's Department of Ecology chose to continue the hardness/concentration relationship down to hardness of less than 25 mg/L does not make scientific sense as it is clearly evident that the hardness dependent dissolved conversion factor for some metals cannot be applied at a hardness of less than 25 mg/L. A factor of "1" should be used instead."

Response 5:

Washington Standards for hardness dependent dissolved toxicity criteria do not recognize the minimum hardness cutoff and any TMDL must continue to use the State standards. The dissolved to total recoverable ratio used for establishing total recoverable permit limits will be determined from the most appropriate ratio using either effluent data, river data, or assumed ratios. However, Ecology agrees that a dissolved/recoverable ratio less than one makes no sense. In no case will a dissolved to recoverable metal ratio less than one be used to calculated a total recoverable effluent limit.

Comment 6:

"But even though the Spokane River point sources may constitute a lesser segment of the metals loadings to the river, nevertheless they DO contribute to the problem. Therefore, it is the Council's position that Washington's TMDL require REDUCTIONS – or at least NO INCREASES – in metals loadings to the river. In recognition of the difficult situation facing Washington discharges when metals exceedences in the river are mostly caused by upstream sources in Idaho, the Council supports the approach taken in the TMDL which allows an allocation to the Washington dischargers (based on hardness) along with limits based on performance (what can reasonably be achieved using existing technology) – whichever is more

stringent. We believe this approach provides a fair and reasonable means of achieving water quality standards and metals reductions in the context of the bi-state nature of the problem."

Response 6:

The low concentrations of metals being measured in the effluent and the technical difficulty of ultra-clean sampling has caused Ecology to add a 10 percent buffer to any performance-based limits. Ecology believes that this approach will still result in the dischargers preventing unnecessary increases in effluent concentration while not unduly exposing them to permit violations. It is anticipated that the dischargers will pursue opportunities to reduce sources of metal in their systems and hopefully actually see a decline in metals as was experienced with silver in the City of Spokane's system.

Comment 7:

"On the issue of metals discharges based on hardness of the effluent and river waters, the Council wishes to point out some key areas of concern as a caution against this becoming at all the sole approach taken in the TMDL. Our concerns include the following:

- that a precedent will be set to encourage use of (harder) groundwater by industry as a
 means of increasing overall metals discharges to the river, and the effect this will have on
 groundwater resources both in terms of consumption and in terms of possible increases in
 metals to the groundwater, when the river loses flow to the groundwater further
 downstream;
- that increases in use of (harder) groundwater, allowing a greater discharge of metals to the river, will result in an increase in metals in the bed and bank sediments of the river;
- the lack of research/guarantee that the potential increase in total metals loadings (due to added hardness in the effluent) will not result in metals becoming "unbound" or more toxic and bio-available under various conditions relating to pH, etc.
- that additional metals loadings to the river (at hardness levels) may result in an increase in toxic, bio-available metals further downstream at Lake Roosevelt, where the hardness of the river decreases. As you know, DOE water quality studies conducted on Lake Roosevelt in 1988 and 1994 cite the Spokane River as an additional metals source to lower Lake Roosevelt. In the 1988 DOE report, metals concentrations in sediment from the Spokane River flowing into Lake Roosevelt were found to be relatively high in all metals, especially zinc. A subsequent study by the U.S. Geological Survey in 1994 also revealed excessive levels of cadmium and zinc in the Spokane River arm of the lake."

Response 7a:

The performance-based approach and evaluation of metal data at each permit renewal should prevent unnecessary increases in metal loading to the river even if the hardness of the effluent increases. Any significant change in character of the dischargers effluent will also require a modification of the permit and an AKART evaluation.

Response 7b:

It is acknowledged that changing in-stream conditions may affect the over-all impact of metals in the Spokane Basin. However, with the proposed controls and monitoring of the Washington Cadmium, Lead, and Zinc in the Spokane River:

dischargers there is a reasonable assurance that their discharge will not further degrade the receiving environment while the major sources of metal and historical contamination are adequately controlled.

Comment 8:

"Also given the above concerns, the Council strongly supports the inclusion of performance-based limits in this TMDL as an additional approach for controlling metals discharges. From discussions with DOE and the Spokane River dischargers (at the October 21, 1998) public workshop on the TMDL), the Council understands that there are many ways that performance-based limits can be imposed on current dischargers that will not cause an unfair burden of compliance. The Council urges DOE to meet with the individual dischargers to develop a technical plan on how to establish such limits. The Council also requests to be included in such discussions to ensure that such performance-based limits will indeed provide a more stringent means of controlling metals discharges to the river."

Response 8:

Ecology will use the EPA guidance for establishing performance-based limits, but will add a 10 percent buffer to the traditional performance-based limit. This will help account for some of the extra uncertainty associated with relatively new ultra-clean/low level sampling and analytical techniques being used to quantify the low levels of metals.

Comment 9:

"In further support of establishing effective performance-based limits, the Council wishes to re-emphasize that this TMDL is based solely on DISSOLVED quotient of total metals loadings, without any guarantee that the greater "bound" quotient won't become dissolved downstream or under altered water quality conditions. The heavy reliance on the factor of hardness, to the exclusion of other water quality conditions and river aspects, illustrates a built-in bias towards allowance of INCREASED metals loadings to the river system.

Therefore, we urge the maximized use of safety margins and conservative ratios – as well as performance-based limits – to be employed toward the goal of reducing metals loadings to the river system."

Response 9:

Ecology agrees that there may be other issues associated with metal contamination which is not addressed by the dissolved metal standards. That is partly why Ecology has begun addressing concerns for freshwater sediment contamination. The issue of dissolved versus particulate fractions of metals and the impact on the receiving environment is largely unresolved in the Spokane Basin. The current load of particulate metals in the river system is almost entirely caused by historical mining contamination. The proposed TMDL currently does not address the particulate fraction issue from Washington dischargers and does not attempt to quantify the effects other sources such as combined sewage overflow (CSO) and stormwater have on the river metals. It is assumed that those sources of metals will be reduced in the future as stormwater BMPs and plans for CSO elimination are implemented in the watershed and as the upstream source is reduced, the river will also benefit from the other relatively small source reductions.

Amendment to the proposed TMDL

Some comments have expressed concern for the uncertainty of the very low concentrations being measured and the increased chance of sample contamination causing unwarranted permit violations. To address this concern, the final TMDL will be amended so that a 10 percent buffer will be added to any performance-based limits before they are compared to the end-of-pipe hardness-based limits. The most stringent limits derived from the two methods will be placed into the discharge permits as described in the TMDL document.

Implementation Plan

The success of the proposed TMDL largely relies on the upstream sources in Idaho to be controlled so that the toxicity criteria of Washington's Water Quality Standards for Surface Water (WAC 173-201A) are met at the Washington/Idaho border.

All Spokane River NPDES discharge permits in Washington, which do not currently have adequate metals monitoring, will be opened and monthly monitoring using appropriate clean sampling and EPA 1600-series analytical methods for total recoverable metals will be added by the end of 1999. Quarterly dissolved metals monitoring should also be included if discharger specific effluent dissolved/total recoverable metals ratios are to be determined.

Effluent limits will be placed in all NPDES permits for direct discharge to the Spokane River where adequate low-level effluent data exist. All Spokane River dischargers will have the TMDL-based limits placed in the permit within 2½ years from the initiation of monthly low-level monitoring. Monitoring requirements have already been placed in the Liberty Lake Sewer District permit and effluent metals limits will be put into City of Spokane's permit which is now targeted to be issued in June 1999.

Appendix C

Quality Assurance Project Plan



STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

7171 Cleanwater Lane, Building 8, P.O. Box 47710 • Olympia, Washington 98504-7710

July 31, 1992

approved 1/3:/92

TO:

Will Kendra

FROM:

Greg Pelletier

SUBJECT:

Spokane River Metals Project Proposal and Scope

The Eastern Regional Office has requested a project assessing the need for a Total Maximum Daily Load (TMDL) for metals in the Spokane River. The 1992 305(b) report listed the Spokane River as water quality limited for Zn, Cu, Pb, Cd, and Hg. Major sources of metals include leaching from mine tailings in the Coeur D'Alene River in Idaho.

Study Objectives:

- 1. Obtain accurate data on total, total recoverable, and dissolved concentrations of Zn, Cu, Pb, Cd, and Hg at various locations in the Spokane River.
- 2. Measure water effect ratios using the methods proposed by EPA
- 3. Prepare a report that:
 - establishes the quality of the data;
 - evaluates partitioning between particulate/dissolved metal;
 - evaluates alternatives for implementation of metals criteria;
 - assesses compliance with water quality criteria;
 - recommends approaches to implementing Ecology's TMDL process; and
 - shares QA/QC data and supplements statewide metals partitioning database being developed by the Toxics, Compliance, and Ground Water Investigations Section (TCGWIS) for FY93 project for Water Quality Program.

Proposed Sampling Sites:

Samples for total, total recoverable, and dissolved metals will be collected six times (Jul-92, Sep-92, Nov-92, Jan-93, Mar-93, May-93) at three stations:

- 1. Spokane River near Post Falls (RM 101);
- 2. Spokane River near Trent Bridge (RM 85); and
- 3. Spokane River near Seven Mile (RM 62).

Will Kendra Page 2 July 31, 1992

Samples for water effect ratios will be collected at two stations (RM 101 and 62) in Sep-92.

Field Schedule:

July 1992 - May 1993

Lab Cost:

\$60,000

Draft Report:

December 1993

Final Report:

March 1994

Clients:

Carl Nuechterlein and Ken Merrill (ERO)

GP:kd

cc: Carl Nuechterlein

Ken Merrill Lynn Singleton Mark Hicks Art Johnson

Steve Butkus

July 31, 1992

PROJECT PROPOSAL AND SCOPE OF WORK Spokane River Metals Zn, Cu, Pb, Cd and Hg

The Eastern Region has requested a project assessing the need for a Total Maximum Daily Load (TMDL) for metals in the Spokane River. The 1992 305(b) report listed the Spokane River as water quality limited for Zn, Cu, Pb, Cd, and Hg. Major sources of metals include leaching from mine tailings in the Coeur D'Alene River in Idaho. The State of Idaho is presently conducting a problem assessment of metals loading from abandoned tailings and plans to determine feasibility of reducing metals loading from these sources.

A TMDL analysis generally begins with an estimate of the loading capacity of a receiving water, which depends on how water quality criteria are implemented. The current 305(b) assessment of water quality limitation is based on applying water quality criteria to total recoverable concentrations in the river. Alternative approaches to implementing criteria will be developed in this project.

The major issue for metals criteria is the correlation between metals that are measured and metals that are biologically available. Beginning in 1984, EPA suggested that acid-soluble metals might be representative of biologically available metals [1]. However, a final method for measuring acid-soluble metals was not adopted. EPA has since abandoned the idea of using acid-soluble metals for application of criteria in favor of other approaches.

EPA currently endorses three approaches to implementing metals criteria [2]:

- 1. The simplest approach is to measure total recoverable metals in ambient waters and to compare such measurements to national or state-wide criteria. This is also the most conservative approach and may overestimate the biologically available metals.
- 3. Dissolved metals can be measured in ambient waters and compared with criteria. Since effluent limits are generally expressed as total recoverable metals, it is necessary to translate between the dissolved and total recoverable concentrations in the ambient. This is done by determining the fraction of total metals present in dissolved form.
- 3. For implementing metals criteria established from laboratory toxicity tests, an adjustment of the criteria value can be measured. The water effect ratio of the ambient water can be measured using toxicity tests. The water effect ratio compares the toxicity of a pollutant in the actual site water to its toxicity in laboratory water for two or more aquatic species. Because the metal's toxicity in laboratory water is the basis for the national criteria, the water effect ratio is used as an adjustment to obtain a site-specific value. The water effect ratio may either increase or decrease the criteria value.

OBJECTIVES

- Obtain accurate data on total, total recoverable, and dissolved concentrations of Zn, Cu, Pb, Cd, and Hg at various locations in the Spokane River;
- 2) Measure water effect ratios using the methods proposed by EPA [2];
- 3) Prepare a report that:
 - establishes the quality of the data;
 - evaluates partitioning between particulate/dissolved metal;
 - evaluates various alternatives for implementation of metals criteria;
 - assesses compliance with water quality criteria;
 - recommends approaches to implementing Ecology's TMDL process;
 - shares QA/QC data and supplements statewide metals partitioning database being developed by Toxics/Compliance/Groundwater Investigations Section for FY93 project for Water Quality Program.

The Toxics/Compliance/Groundwater Investigations Section is conducting a concurrent metals project statewide that has objectives similar to 1 and 3 above [3]. The Spokane River study by WAS and the TCGWIS statewide study will share QA/QC data and use the same sampling and laboratory protocols to assure data quality and comparability.

PROPOSED SAMPLING SITES

Samples for total, total recoverable, and dissolved metals will be collected six times (Jul-92, Sep-92, Nov-92, Jan-93, Mar-93, May-93) at three stations:

- Spokane River near Post Falls (RM 101)
- Spokane River near Trent Bridge (RM 85)
- Spokane River near Seven Mile (RM 62)

Samples for water effect ratios will be collected at two stations (RM 101 and 62) in Sep-92.

The proposed station locations were selected to bracket locations of major point source discharges and the spatial variability in river hardness and metals concentrations based on a review of available Ecology Ambient Monitoring data. Groundwater inflows between RM 101 and 85 significantly increase hardness and potentially decrease metals concentrations. Seasonal variability in metals and other parameters is also apparent.

CHEMICAL ANALYSIS

The frequency of non-detects and qualified data are a potential problem in relying solely on a total recoverable analysis to assess metals partitioning in river water. Therefore, the proposed survey will also include a total analysis using a pre-concentration step that improves

detection limits. The dissolved analysis will also be preceded by pre-concentration in order to consistently quantify the low levels of dissolved metals expected in many of these samples.

Two laboratories will be employed:

- 1. Battelle Marine Research Laboratory Battelle will analyze total and dissolved Cu, Pb, and Cd by pre-concentration using APDC co-precipitation and GFAA [4]. Zn will be analyzed by direct GFAA. Hg will be analyzed by CVAA. Method detection limits (ug/L) are approximately as follows: Zn 0.3, Cu 0.03, Pb 0.03, Cd 0.01, and Hg 0.001. The accuracy of the data will be evaluated by analyzing a standard reference material with each sample collection (submitted blind: SLRS-2, filtered Ottawa River water prepared by the National Research Council of Canada; NBS 1641-b Hg in water). Battelle will supply a complete QA package including results of procedural blanks, uncorrected, and blank-corrected sample data for review by the Manchester Laboratory.
- Manchester Laboratory Manchester will analyze total recoverable metals by GFAA (Cu, Pb, Cd), ICP (Zn), and CVAA (Hg). Precision and accuracy of these data will be evaluated from results of matrix spikes (with duplication) and standard reference materials (NBS 1643-b, which has higher concentrations than SLRS-2, will be submitted blind). A data quality report will be prepared internally by Manchester.

Ancillary water quality variables include field measurement of temperature and pH, and lab analysis (Manchester) of parameters recommended by EPA [2]: TSS, TDS, TOC, DOC, total hardness, specific conductance, and alkalinity. Additional ancillary parameters in the Spokane River samples will include major cations and anions for use in partitioning models (e.g. MINTEQ): sulfate, chloride, nitrate-nitrite, Ca, Mg, Na, and K.

SAMPLE SIZE

For each site, single grabs will be collected every other month for one year and analyzed for total metals, total recoverable metals, dissolved metals and ancillary variables. A field replicate sample and a duplicate laboratory analysis (both will be submitted blind) will be done for two sites from the combined WAS/TCGWIS study on alternating sampling events to evaluate field and lab variability. Field replicate samples will be collected approximately 15 minutes apart at a selected station. Lab duplicates will be identical subsamples of a homogeneous sample.

One site from the Spokane River will be selected for field replication to assess total sampling variability during each of the six sampling events. Analysis of field replicates will be limited to total metals, dissolved metals and ancillary variables. Lab duplicate samples and additional field replicates may be performed on stations not in the Spokane River since the Spokane River sampling will be combined with sampling of four other rivers across the state [3].

SAMPLING METHODS

To reduce the possibility of contamination, all samples will be surface grabs collected by hand from the river thalweg. Representative sampling sites for hand collection will be identified during site reconnaissance in July 1992. Metals samples will be taken using precleaned teflon bottles, pre-cleaned filter units, and pre-packaged, high purity acid as preservative, all to be supplied by Battelle. In order to improve comparability of data, metals samples analyzed by the two laboratories will be duplicates (splits) rather than separate grabs. A transport (bottle) and filter blank will be prepared every other collection and analyzed by Battelle (also submitted blind).

WATER EFFECT RATIO ANALYSES

Methods proposed by EPA [2] will be used for measuring water effect ratios. Bioassays will be conducted by the Manchester Laboratory. Acute toxicity tests of a vertebrate and invertebrate species will be used. The vertebrate species will be rainbow trout. Daphnia magna will be used for the invertebrate tests.

Samples for water effect ratios will be collected at two stations on one date. The stations were selected to represent low hardness water near the state line and a downstream location below major NPDES discharges and groundwater inflows. The samples will be collected during early September 1992 to represent low flow conditions that are critical for WTP effluent dilution.

TIME TABLE

First sample collection - July 92
Field collections completed - May 93
Data report - July 93
Draft project report - December 93
Final report - March 94

ESTIMATE OF ANALYTICAL COST

Total/Total Recoverable/Dissolved Metals:	\$31,449
Water Effect Ratios:	\$28,500
TOTAL LAB BUDGET:	\$59,949

REFERENCES

- EPA, 1986. Quality Criteria for Water 1986. U.S. Environmental Protection Agency. Office of Water Regulations and Standards. EPA 440/5-86-001.
- EPA, 1992. Interim Guidance on Interpretation and Implementation of Aquatic Life Criteria. Health and Ecological Criteria Division. U.S. Environmental Protection Agency. May, 1992.
- Johnson, 1992. Preliminary scope of work for EILS/TCGWIS project for statewide metals sampling for FY93. Department of Ecology. Environmental Investigations and Laboratory Services Program.
- 4. Bloom, N.S., E.A. Crecelius. 1984. Determination of silver in sea water by coprecipitation with cobalt pyrrolidinedithiocarbamate and zeeman graphite-furnace atomic absorption spectrometry. Analytica Chimica Acta, 156 (1984) 139-145.

Appendix D

Technical Report

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